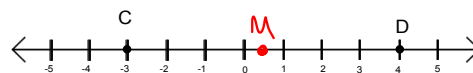


## 8-1 Midpoint and Distance Formulas

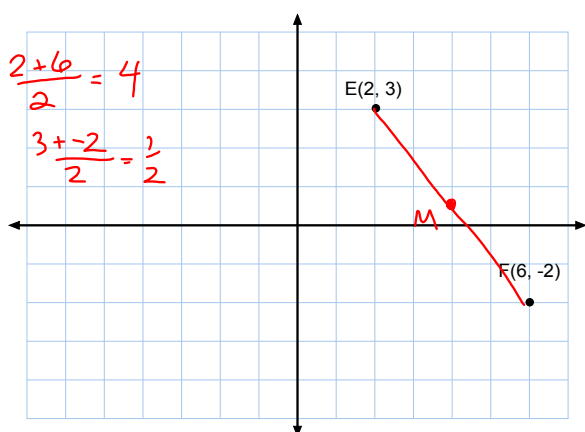


$$\frac{3+8}{2}$$

5.5 midpoint



$$\frac{-3+4}{2} = \frac{1}{2}$$



$$\frac{2+6}{2} = 4$$

$$\frac{3+(-2)}{2} = \frac{1}{2}$$

## Midpoint Formula

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Find the midpoint of:

A(4, 3)

B(-2, 5)

$$\overline{AB} \quad \left(\frac{4+(-2)}{2}, \frac{3+5}{2}\right)$$

M(1, 4)

M is the midpoint of  $\overline{AB}$ . Find the other endpoint if:

A(8, 3)

M(12, 5)

B(?, ?)

$(x, y)$   
 $(16, 7)$

A(-1, 0)

M(-3, 5)

B(?, ?)  $(-5, 10)$   
 $(x, y)$

$$\frac{8+x}{2} = 12$$

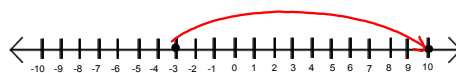
$$8+x = 24$$

$$\frac{3+y}{2} = 5$$

$$3+y = 10$$

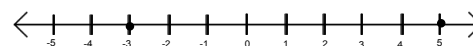
$$y = 7$$

Find the distance between the two points.

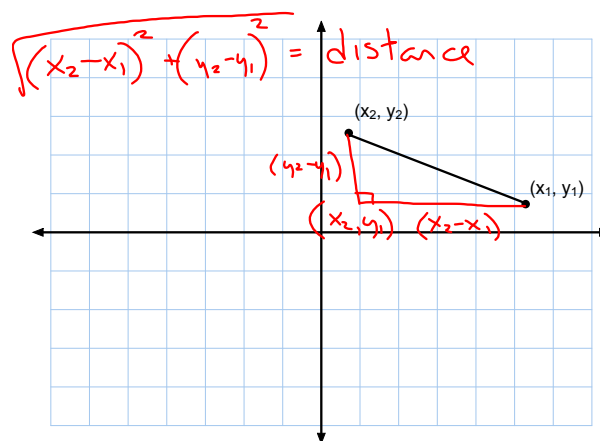
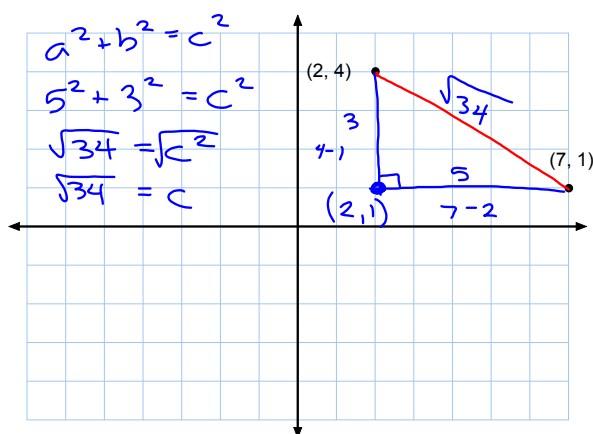


$$|10 - -3| = 13$$

$$|-3 - 10| = 13$$



$$d = 8$$



## The Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Find the distance between:

(-1, 4) (2, -3)

$$d = \sqrt{(2 - -1)^2 + (-3 - 4)^2}$$

$$d = \sqrt{9 + 49}$$

$$d = \sqrt{58} \text{ units}$$

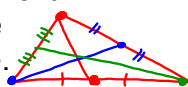
Find the distance between:

(2, -5) (3, 1)

$$d = \sqrt{1 + 36}$$

$$d = \sqrt{37}$$

Median of a triangle--is a segment that connects a vertex and the midpoint of the opposite side.



Example 1:

Find the length of the median from C to  $\overline{AB}$ .

A(-3, 0)

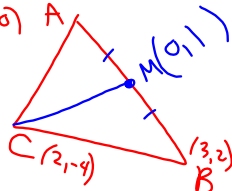
B(3, 2)

C(2, -4)

$$M\left(\frac{-3+3}{2}, \frac{0+2}{2}\right)$$

$$M(0, 1)$$

(-3, 0) A



$$CM = \sqrt{(2-0)^2 + (-4-1)^2}$$

$$CM = \sqrt{4 + 25}$$

$$CM = \sqrt{29}$$

Example 2:

Find the length of the median from A to  $\overline{CB}$ .

A(-3, 0)

B(3, 2)

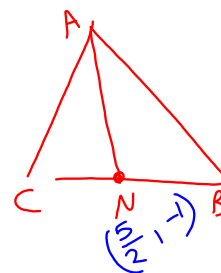
C(2, -4)

$$AN = \sqrt{\left(-3 - \frac{5}{2}\right)^2 + \left(0 - (-1)\right)^2}$$

$$= \sqrt{\frac{121}{4} + \frac{4}{4}}$$

$$= \sqrt{\frac{125}{4}}$$

$$= \frac{\sqrt{125}}{2} = \frac{5\sqrt{5}}{2}$$



HW  
p414-415  
11-17, 25-33 odd, 36, 37